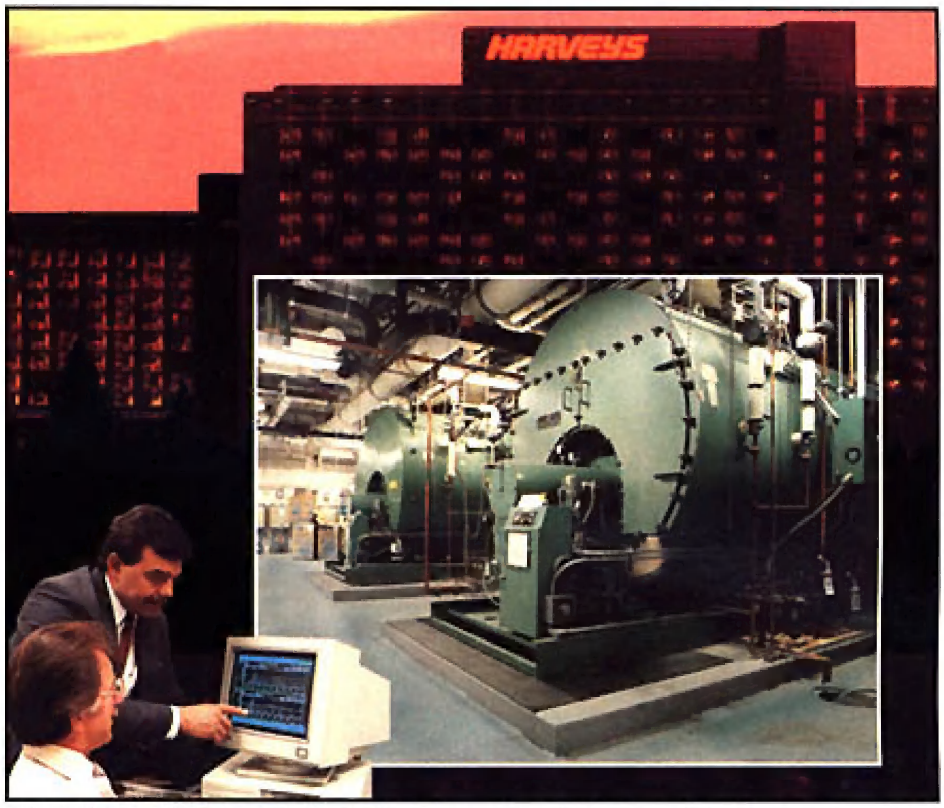
Trendmaster® 2000: A success story

Case History

Harveys Resort Hotel and Casino is a 719 room facility situated in Lake Tahoe, Nevada, USA. This one million square foot facility provides luxurious accommodations to thousands of guests each year. Guests arrive from all over the world to relax and enjoy the wide variety of entertainment and sports available at Harveys and the surrounding area. Harveys importance to the area economy is illustrated by the approximately 2500 jobs it provides.

Resorts must keep guests happy and comfortable to obtain repeat business. Harveys is open 24 hours-a-day, 7 days-a-week. As there is no optimum time for shutdown, Harveys relies on their maintenance department to keep their machinery up and running. This department, headed by Mr. Phil Herback, Director of Facilities Management and Mr. Bob Evans, Engineering Manager, is responsible for keeping hundreds of pieces of machinery on-line. This includes 80 pump sets (up to 40 hp), 27 high-volume air handling units (up to 250 hp), 3 high-pressure steam boilers and 5 centrifugal chillers (up to 500 hp).

With 42 employees dedicated to the mechanical maintenance of the facility, Harveys operates with one of the smallest mechanical maintenance staffs for a facility of its size in the casino/resort industry. They can operate with such a small staff due to their history as an innovator and leader in the field of predictive maintenance. Harveys maintenance management is constantly looking for new products and processes that will enable them to improve their predictive maintenance program. Bently Nevada's Trendmaster 2000, a PC-based, on-line data acquisition and diagnostics system for general-purpose machinery, is an innovative product that fits their needs.



Phil Herback, Director of Facilities Management and Bob Evans, Engineering Manager of Harveys Resort Hotel/Casino view trend graph data on boiler blower motor inboard bearing.

The business problems and the solution

Bently Nevada, through its corporate headquarters and sales office in Minden, Nevada, USA, has been associated with Harveys since early 1987. At that time, Harveys was looking for a product that would allow them to detect machinery malfunctions more quickly through routine manual data collection. They chose Bently Nevada's original Trendmaster, a portable data collection and reduction instrument for use on rolling element bearing machinery. Employing two people to gather and reduce data, Harveys realized the benefit of establishing baseline data and trends on their essential rotating equipment. However, this "portable" data collection program did have some disadvantages. The two most notable disadvantages were:

1) costly machinery malfunctions that were "missed" due to infrequent data collection.

2) lack of trained personnel for gathering data at established collection intervals.

A casino/resort relies on stringent environmental controls to keep the atmosphere in their facility comfortable. Harveys is constantly cooling its casino level even when the temperature

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outside is below freezing. The distribution of heating and cooling for the facility, including its 719 hotel rooms, 27,000 square foot convention center and, most importantly, its 81,000 square foot casino area, is dependent on the proper operation of the machines mentioned earlier.

Resort industry studies have concluded that guests who are uncomfortable will go to the next casino/resort and rarely return either during their stay or during subsequent visits. The result is lost revenue now and possibly in the future due to poor image. In an industry where one day's revenue can mean the difference between a monthly profit or loss, effective and efficient machinery maintenance is required.

The success of a "portable" data collection program depends on experienced personnel. When these trained employees are unavailable due to other duties, sickness, vacations or departure, data collection isn't accomplished. The resulting increase in time between collection periods increases the possibility of not finding a machinery malfunction before major damage occurs. Harveys realized that data was not collected regularly on their machinery because their experienced personnel were busy working on unplanned maintenance jobs.

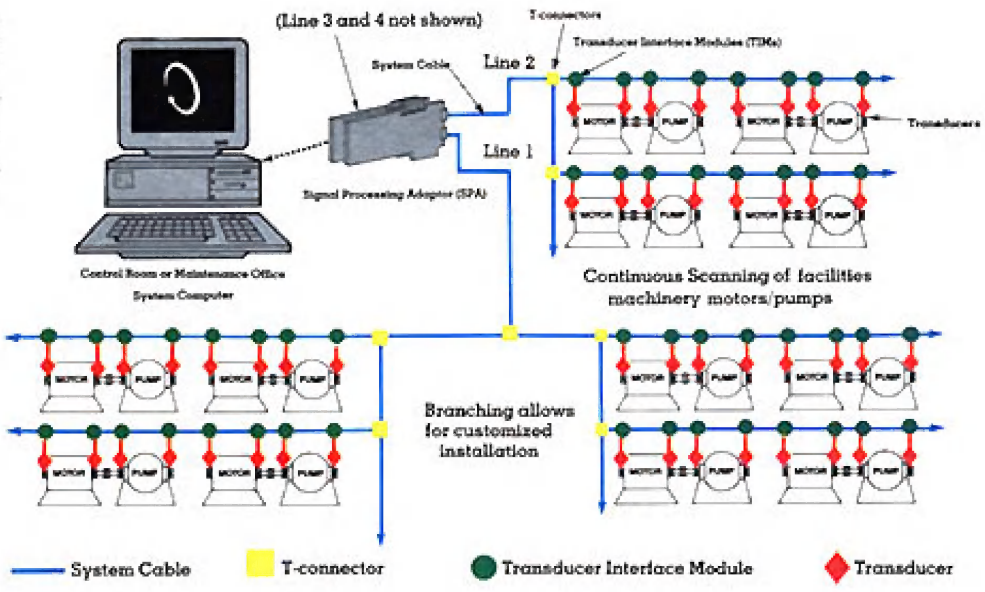
These disadvantages made them aware of a need for a cost-effective, permanently-installed, on-line system for data collection and reduction. They needed a system that could automatically record accurate machine data more frequently than a manual "walk-around" program. In 1989, Phil Herback decided that, based on past experiences, Harveys had to improve its data collection program. He selected the Trendmaster 2000, a system with an advanced "single-line" architecture that minimized installation wiring costs, which was a major concern. Trendmaster 2000 allows the resort to continuously gather trending data on machines and to collect and diagnose dynamic data.

The application and installation

The innovative design of Trendmaster 2000 allowed Harveys to start initially with a small system and to gradually expand their system as funds were available. Their management decided on an initial installation of approximately 65 machinery points comprised of vibration and temperature transducers on essential machines within the facility. This small system permitted them to "test" the system before making a large-scale commitment. Using printouts of existing data collection routes, 30 rolling element bearing machines were identified for the initial system, selection was based on machinery importance, accessibility and identified problems.

Case-mounted seismic transducers were installed on the inboard and/or outboard bearings of 25 pump motors and three boiler blower motors. Vibration transducers were also installed on the bearings of two supply fans. Temperature transducers were mounted on a number of these motors to record the motor's skin temperature. Bently Nevada engineers aided in the system design while Harveys maintenance personnel►

Typical Trendmaster® 2000 System Configuration



handled the majority of the installation. The Trendmaster 2000 installation was completed in January 1990. Harveys began profiting from the system almost immediately.

Three machine saves in the first four months

Date: 24 January, 1990

A frequency spectrum plot indicated high frequency bearing vibration components on one of the two air supply fans (Figure 1). This condition was identified before major damage could occur and the outboard bearing on this fan was replaced. Loss of the fan could have resulted in major income losses to the business as this fan is responsible for supplying air to 40,000 square feet of casino space. Environmental control relates directly to guest comfort and is critical in this service industry.

Date: 27/28 January, 1990

Trendmaster 2000 annunciated direct and rotor alarm conditions for the #2 boiler blower motor inboard bearing. Overall trend graphs indicated high vibration (Figure 2). The motor was shut down and opened which revealed a broken strut on the squirrel cage fan unit. A new cage was ordered. As a temporary solution until the new cage arrived, the strut was welded, the cage was balanced using the Trendmaster® 2000 and maintenance personnel carefully watched the machine. Loss of the motor would have resulted in a 33% loss of total boiler capacity. This would have been disastrous in the winter months for a business that serves the ski season crowd.

Date: 18 April, 1990

A high vibration alarm indicated a possible bearing malfunction on one of two sump pump motors (Figure 3). The motor was shut down. The problem was a disintegrated rubber spider on the coupling. It was replaced within minutes and the motor restarted. The maximum overall vibration level was reduced by approximately 80%. Catching this problem early avoided possible damage to the coupling. Since these two pumps are responsible for groundwater pumping for the facility, loss of the pump could have resulted in possible flooding of the boiler room.

Conclusion

Harveys Maintenance Department is pleased with the Bently Nevada computerized machinery information system installed on their machines. Three machine saves in its first four months of operation has demonstrated the value of the Trendmaster 2000. They now have more accurate and timely data to identify machine malfunctions more quickly. This has minimized unplanned machinery shutdowns. Data that was previously gathered once a month is now collected in less than an hour.

One of the biggest benefits of the Trendmaster 2000 system is that it is no longer necessary for Harveys to maintain large inventories of replacement parts in-house. The early warning capabilities of the Trendmaster 2000 has allowed them to reduce costs by planning maintenance more effectively and efficiently. Harveys has been able to successfully switch from an "on-site inventory" mode for spare parts to a "buy-on-demand" mode. Harveys is now able to use the manpower, money and time that was needed to maintain an on-site inventory for more important tasks.

Phil Herback says one of the goals of Harveys Maintenance Department is to catch 95% of bearing-related failures in motors before major damage occurs. He believes that when additional machinery is connected to the Trendmaster 2000 System, they may even exceed this percentage. Now that data collection on these machines is automated, Harveys has more man-hours available for other important maintenance tasks. This is critical for successful operation of a 24-hour, 7-day, year-round business. Personnel or supplies are not always available when a machine fails. Trendmaster 2000 is an excellent early-warning tool for this type of "survival" work.

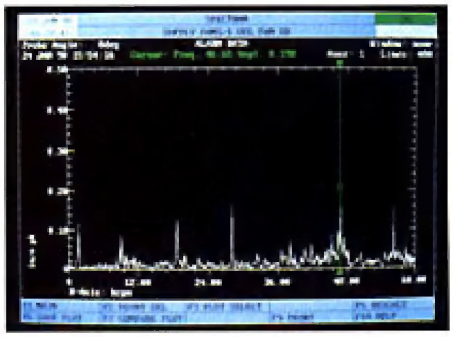


Figure 1

High frequency components shown on frequency spectrum plot indicate damaged bearing on supply fan.

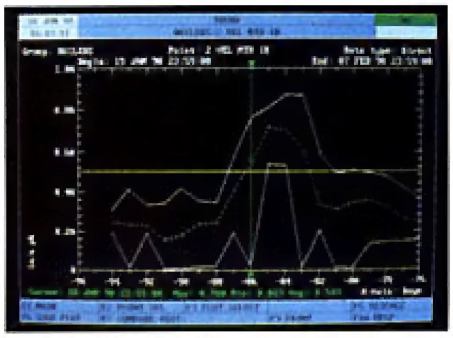


Figure 2

Trend plot for #2 boiler blower motor inboard bearing indicates increasing vibration levels that eventually exceeded user-defined alarm levels.

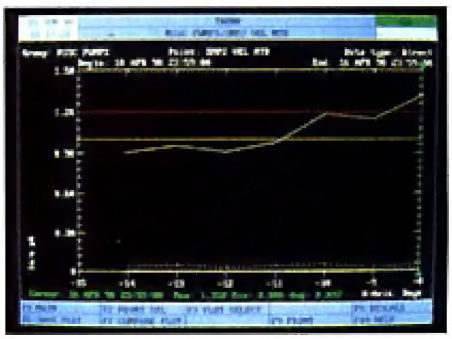


Figure 3

Alarm annuciation occurs as vibration level on sump pump motor bearing exceeds alarm levels.